Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) EXAMINATION – SUMMER 2024

Subject Code:3132004 Date:06-07-2024

Subject Name: Principles of Materials Science and Metallurgy

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define unit cell and draw (111) and [101].	**03**
	(b)	What are the effect of following elements in steel: (i) Carbon (ii) Silicon (iii) Nickel (iv) Chromium.	**04**
	(c)	Write a Short note on Solidification Defects with its causes and remedies.	**07**
Q.2	**(a)**	Define Metallography. Differentiate between micro and macro structures of materials.	**03**
	(b)	Write a material selection Process for a Crankshaft of Engine.	**04**
	(c)	Explain Point defect, Line Defect and Plane defect.	**07**
		OR	
	(c)	Explain the “Hume-Rothery Rules” for solid solution with suitable case study.	**07**
Q.3	**(a)**	Explain the allotropic behavior of iron with sketch.	**03**
	(b)	Differentiate between malleable and nodular cast iron.	**04**
	(c)	Explain in detail, the pearlitic and bainitic transformations using TTT diagram.	**07**
		OR	
Q.3	**(a)**	Explain the structure-property-performance relationship with suitable example.	**03**
	(b)	What is coring? Why it is observed?	**04**
	(c)	Explain in detail, the ultrasonic testing method with its benefits and limitations.	**07**
Q.4	**(a)**	State critical reactions of Iron-carbon phase diagram.	**03**
	(b)	What is powder metallurgy? State applications of the powder metallurgy.	**04**
	(c)	Differentiate between edge and screw dislocation with sketch.	**07**
		OR	
Q.4	**(a)**	Classify engineering materials and discuss mechanical properties.	**03**
	(b)	Explain optical metallurgical microscope with neat sketch.	**04**
	(c)	Explain working principle of Eddy current Test. Mention various applications of Eddy Current Test.	**07**
Q.5	**(a)**	What information’s may be obtained from an equilibrium diagram?	**03**
	(b)	Write a purpose of the case hardening heat treatment and explain any one in detail.	**04**
	(c)	Explain jominy hardenability test with a neat sketch.	**07**
		OR	
Q.5	**(a)**	Differentiate between annealing and tempering.	**03**
	(b)	Explain the procedure of specimen preparation for microstructure examination.	**04**
	(c)	Determine atomic packing factor for FCC crystal structure with sketch.	**07**

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